9. Organisms and Environment - I

9.0 : Introduction

Q.1. Define: Ecology and Ecosystem.

Ans:i) **Ecology :** It is a branch of biology which deals with the interactions among living organisms (biotic) and between the organisms and their physical (abiotic) environment.

ii) Ecosystem: It is a functional unit of nature, where organisms interact with each other and their surroundings.

9.1 : Habitat and Niche

Q.2. Define Habitat.

Ans: Habitat is a specific physical place or locality occupied by an organism, population or community which has a particular combination of abiotic or environmental factors.

Q.3. Explain ecological niche. What are its different types ?

Ans: An ecological niche refers to an organisms' place in the biotic environment and its functional role in an ecosystem. If we define habitat as the address of an organism, then ecological niche can be defined as the profession of an organism.

There are three aspects of ecological niche :

i) **Spatial or habitat niche:** It denotes the actual physical space occupied by the organism.

ii) **Trophic niche:** It denotes the functional position of an organism in the ecosystem.

iii) **Hyper volume (Multi-dimensional) niche:** It refers to the position of an organism 10 the environmental gradients.

Q.4. Habitat and niche, explain the difference.

Ans:

No.	Habitat	Niche
i)	A specific physical space occupied by an organism, population or a community.	An organisms place in the biotic environment and its functional role in an ecosystem.
ii)	Many species may show cohabitation in the same habitat.	Only one species occupies an ecological niche.

9.2 : Ecosystem / Ecological System

Ecosystem and its kinds

Q.5. Define ecosystem.

Ans: Ecosystem (eco= environment; system= interacting and interdependent complex) Ecosystem is an integrated system resulting from interaction of living and non-living factors of an environment. It includes all the organisms (i.e. communities) in a given area that interacts with the physical environment; e.g water, air, soil, etc. by means of food chains and chemical cycles resulting in energy flow, biotic diversity and material cycling.

Q.6. What are the two kinds of ecosystems? Give examples.

Ans: The two kinds of ecosystems are:

i) **Natural ecosystems:** These ecosystems operate under natural conditions without any major interference of man. They may be terrestrial such as forest, grassland, desert, etc. or aquatic such as pond, river, lake, wetland, estuary, etc.

ii) **Artificial ecosystems:** These are man-engineered and maintained artificially by man by addition of energy and planned manipulations. e.g. croplands and an aquarium.

Q.7. What does the structure and function of an ecosystem include ?

Ans: Structure of ecosystem includes:

i) The composition of biological community, i.e. the species, numbers, biomass and distribution.
ii) The quantity and distribution of non-living materials such as nutrients, water, etc.
iii) The range or gradient of conditions of existence, such as temperature, light, etc.

Function of ecosystem includes:

i) The biological energy flow, i.e. the production and respiration rates of the community.
ii) Nutrient cycles and regulation of the organisms by the environment and regulation of environment by the organisms.

Components

Q.8. Describe the components of an ecosystem.

Ans: Two major components of an ecosystem are :

i) Biotic (living) components :

These include the living elements of an ecosystem. Based upon their nutritional relationship, they can be divided into :

a) Autotrophic components (auto = self, trophos = feeder) :
These include green plants, photosynthetic bacteria and cyanobacteria which can prepare their own food. These are usually called as producers as they form the primary basis of life and provide food, shelter and oxygen to the animals and also maintain C02/02 balance of nature.

b) Heterotrophic components (heteros=other, trophos= feeder) :
These include those organisms which consume either readymade organic food or decompose the complex organic compounds. It includes two classes of consumers:
i) Microconsumers – They are commonly called as decomposers.
ii) Macroconsumers – It includes herbivores, carnivores and omnivores.

ii) Abiotic components :

These include the non-living physio-chemical factors of environment.
These are divided into three basic categories :

a) Inorganic materials: e.g. carbon, nitrogen, CO_2, H_2O, phosphorous, etc.

b) Organic compounds: These are present in dead organic matter and include carbohydrates, proteins, lipids, nucleic acids, etc.

c) Climatic and Edaphic factors:
These include light, temperature, humidity, wind, etc. Edaphic factors (factors associated with soil) include pH, topography of soil.

Q.9. Explain the two spatial patterns of ecosystem.

Ans: The two recognized spatial patterns of ecosystem are:

i) Zonation : This spatial pattern occurs horizontally along the ground. Density and distribution of species vary along a horizontal gradient.

ii) Stratification : This spatial pattern occurs vertically, determined by height of organisms. e.g. In a forest community, stratification takes place when trees of different species grow to different heights.

Q.10. What are the basic requirements of an ecosystem?

Ans: Basic requirements of an ecosystem include:

i) Inorganic nutrients (e.g. CO_2 and H_2O)
ii) Autotrophs or producers (e.g. plants)
iii) Decomposers (e.g. Bacteria and fungi)
iv) A source of continuous supply of energy (e.g. Sun)

Productivity and decomposition

Q.11. What is productivity of an ecosystem ?

Ans: Productivity :

The amount of biomass or organic matter, produced per unit area in unit time IS called productivity. Depending upon the trophic level, productivity is of two types :

i) Primary productivity :

It can be defined as the rate at which radiant (solar) energy is captured by producers for synthesis of energy rich organic molecules through photosynthesis. It is again of two types :

a) Gross primary productivity (GPP) :
It refers to total amount of organic matter (Biomass) produced during photosynthesis by the producers.

It is estimated in terms of either chlorophyll content as chllg dry wtlunit area or photosynthetic number as CO_2 fixed/g chllhour.

b) Net primary productivity (NPP) :

It refers to the amount of organic matter stored by the producers (green plants) after meeting the loss by way of respiration.

Net primary productivity = Gross primary productivity – Respiration rate.

ii) Secondary productivity :

It is the rate of energy storage at the level of consumers. The consumers use the food material directly or indirectly from the producers and simply convert it into different forms.

iii) Net productivity :

It is the rate of storage of organic matter which is not used by the consumers. It is equivalent to net primary production minus consumption by the heterotrophic organisms. It is generally expressed as 'production ofC glm2/day.

Q.12. What is primary productivity? Give a brief description of factors that affect primary productivity.

Ans: Primary productivity can be defined as the rate at which solar energy is captured by producers for synthesis of energy rich organic molecules through photosynthesis.

Factors affecting primary productivity :

i) **Environmental factors:** Light (intensity, quality, duration), temperature range, wind, atmospheric humidity, utilizable water availability, nature of soil, etc.

ii) **Availability of nutrients** like water, CO_2, O_2, minerals, etc.

iii) **Topography of area** which include altitude, latitude, direction, etc.

iv) **Photosynthetic capacity** of the producers.

Q.13.What is decomposition ?

Ans: Decomposition is the process by which complex organic compounds are broken into simpler inorganic substances that can be reutilized by plants for their growth. Decomposition is as important as productivity, because without this process, the nutrients cannot be brought into circulation. The upper layer of soil is the main site of decomposition, while detritus (dead organic matter formed of excreta of animals and dead bodies of plants and animals) is the raw material for decomposition.

Q.14.Explain the various steps of decomposition process.

Ans: Steps of decomposition process are :

i) Fragmentation of detritus

This step is carried out by detritivores, i.e. the detritus feeding animals like earthworm. They ingest the organic matter (detritus) which gets pulverised in the digestive tract of the detritivores. The unused, fragmented detritus is sent out as faecal matter by these animals.

ii) Leaching

Several soluble substances like simple sugars and inorganic nutrients are removed from the fragmented detritus by the water percolating through the soil.

iii) Catabolism

Decomposers release extracellular enzymes in their surroundings to breakdown detritus into simpler organic and inorganic compounds. It is carried out by certain bacteria and fungi.

iv) Humification

It is the process by which simplified detritus is changed into dark coloured amorphous substance called humus.

Humus serves two functions :

a) It acts as a reservoir of nutrients.

b) Being porous, it increases the water holding capacity of soil.

v) Mineralization

It involves release of inorganic nutrients (Ca^{++}, NH_4^+, Mg^{++}, K^+, etc) in soil along with the liberation of carbon dioxide and water vapour.

Q.15.Define the term 'leaching'. **[Mar 2013]**

Ans: The precipitation of water soluble inorganic nutrients in the form of salts inside the soil horizon is called leaching.

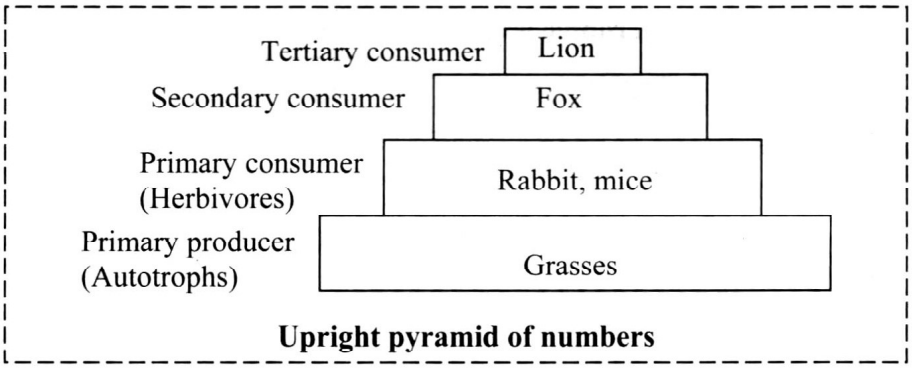
9.3 : Pyramids of number, biomass and energy

Q.16.Define ecological pyramid and describe with examples, pyramid of number and biomass.
Ans:Ecological pyramid :

An ecological pyramid is a graphical representation of an ecological parameter, like number or biomass or accumulated energy at different trophic levels of a food chain in an ecosystem.

i) Pyramid of numbers :

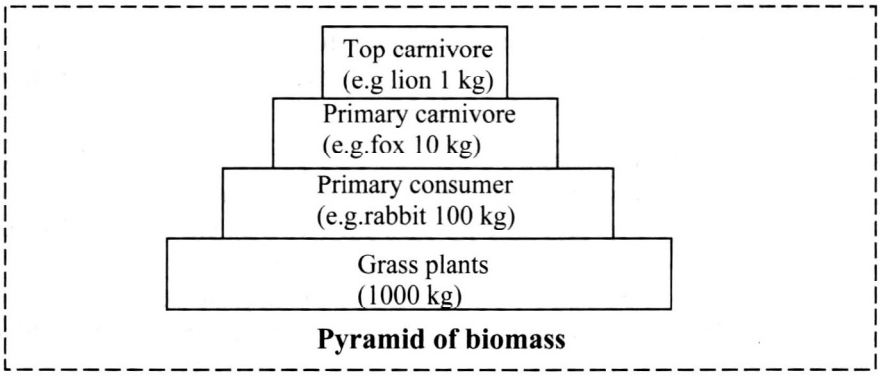
In this type of pyramid, number of producers are more and the number of individuals at the successive higher trophic levels decrease and becomes a few at the top level consumer. In grassland ecosystem, the number of grass plants (producer) or herbs are very large, on which smaller number of rabbits feed which in turn support still smaller number of foxes and so on. In aquatic ecosystem also, the number of phytoplanktons (producers) are very large, on which smaller number of fishes feed and further only a few large sized fishes are supported for food.



Upright pyramid of numbers

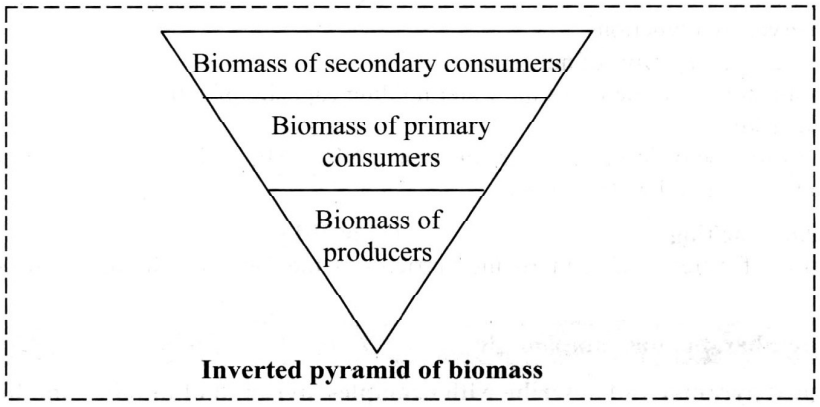
ii) Pyramid of biomass :

Pyramid of biomass is the graphic representation of the amount of organic matter (i.e. biomass) present at the different trophic levels per unit area of an ecosystem. Pyramid of biomass is upright in a terrestrial habitat which shows that biomass is maximum at the level of producers and there is progressive decrease in biomass from lower to higher trophic levels.



Pyramid of biomass

But in aquatic habitats, pyramid of biomass is inverted or spindle shaped, because biomass of phytoplanktons is far below than that of zooplanktons which is further less than that of secondary consumers.



Inverted pyramid of biomass

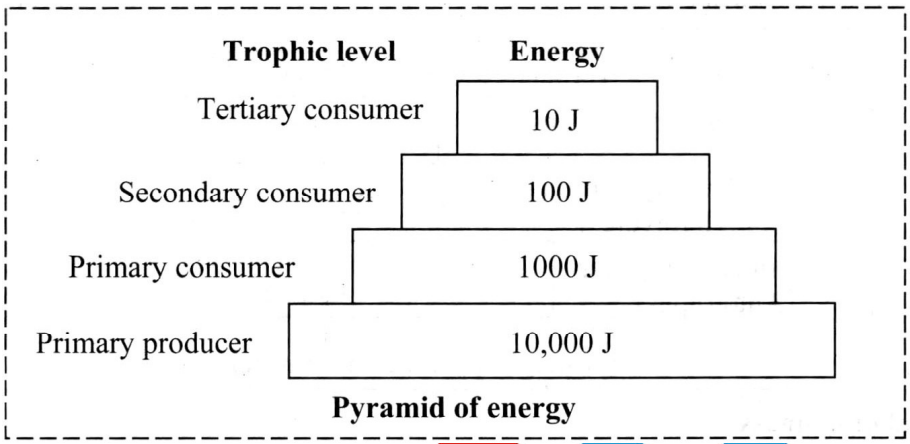
Q.17.Explain the pyramid of energy.

Ans: Pyramid of energy :

i) It is a graphic representation of the amount of energy trapped per unit time and area in different trophic levels of a food chain.

ii) The pyramid of energy in any ecosystem is always 'upright. This is because producers forming the base of the pyramid have maximum amount of energy.

iii) The amount of energy transferred to successive higher trophic levels decreases. This is because at each level, 80-90% energy is utilized for metabolic activities and only 10% energy is available to the next trophic level.



Pyramid of energy

Q.18.Explain why the pyramid of biomass in the sea is inverted.

Ans: In the sea, phytoplanktons are found in large number. However, their biomass is always less than the biomass of fishes which are dependent upon these phytoplanktons. Hence, the pyramid of biomass in the sea is inverted.

Q.19.Distinguish between :

i) Grazing food chain and Detritus food chain

ii) Production and Decomposition

iii) Upright and Inverted pyramid

iv) Primary and Secondary productivity

Ans: i) Grazing food chain and Detritus food chain

No.	Grazing food chain	Detritus food chain
a.	It is a type of food chain where producers occupy the first trophic level and feed energy into the ecosystem. matter.	It is the type of food chain where transfer of energy starts from detritus or decaying organic
b.	Comparatively less amount of energy flows through' this type of food chain, in terrestrial ecosystem. ecosystem.	Comparatively more amount of energy flows through this type of food chain, in terrestrial

ii. Production and Decomposition

No.	Production	Decomposition
a.	Production is the process of formation of biomass or organic compounds from simple inorganic substances or by assimilating certain organic molecules.	It is the process by which the decomposers/saprotrophs breakdown the larger organic molecules into simpler organic and ultimately into inorganic constituents.
b.	It occurs at the level of producers (primary production) and consumers (secondary production)	It occurs at the level of decomposers.

iii) Upright and Inverted pyramid

No.	Upright	Inverted pyramid
a.	It is the type of ecological pyramid where the producers occupy a broad base and the consumers decrease ill terms of energy or number or biomass. biomass.	It is the type of ecological pyramid where the producers form a narrow base, while the consumers are more in terms of number or
b.	Pyramid of energy IS always upright, while pyramids of number and biomass are also upright in several ecosystems;	Pyramid of number ill tree-dominated ecosystem and pyramid of biomass ill an aquatic ecosystem are inverted.

iv) Primary and Secondary productivity

No.	Primary Productivity	Secondary productivity
a.	The amount of biomass or orgalllc matter produced per unit area over a time period by the producers during photosynthesis, constitutes primary productivity.	The rate of assimilation and formation of new organic matter by the consumers, IS called secondary productivity.

Energy flow

Q.20. Describe the concept of energy flow.

Ans:i) Energy flow is unidirectional. Energy captured by autotrophs does not go back to the sun or the energy which passes to herbivores does not go back to autotrophs.

ii) The amount of energy flow decreases with successive trophic levels.

iii) Producers capture 1–5% of the photosynthetically active radiation (PAR) and remaining unutilized energy is released in the form of heat.

iv) A small portion of the energy captured is utilized for respiration of producers and a portion of net primary production (10%) is used to provide food for herbivores.

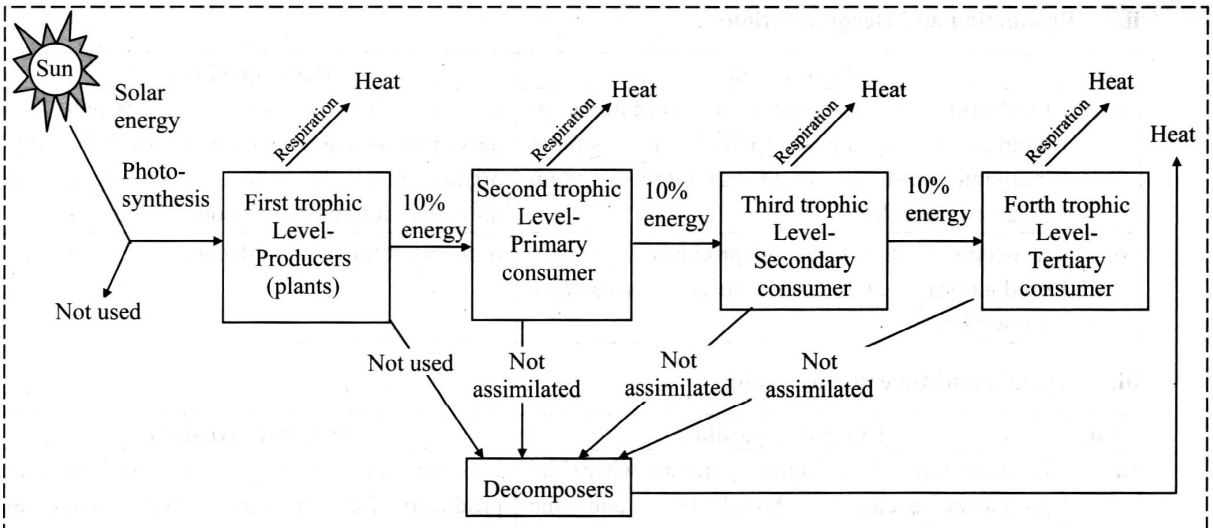
v) The unutilized net primary production is ultimately added to detritus, which is energy for detritivores and decomposers.

vi) Energy obtained by herbivores is used in metabolism and unutilized portion of it is added to the detritus as faeces and released in the form of heat.

vii) The remaining energy in herbivores is used as food by carnivores or it is transferred to decomposers when the herbivores die. In this step also, only about 10% of energy from herbivore passes to the carnrvore.

viii) Cost of respiration increases markedly along successive trophic levels.

ix) Shorter the food chain, greater would be the available food energy and as the length of food chain increases, there is corresponding more loss of energy.



Diagrammatic representation of energy flow

Q.21. "Only a fraction of sunlight is used for photosynthesis." Justify.

Ans: When sunlight falls on the earth surface, about 34% of this is reflected back, 10% is held by ozone layer, water vapour and other atmospheric gases and 56 % reaches the earth's surface. Hence, of the total sunlight reaching the earth's atmosphere, only a fraction, i.e 0.02% is used for photosynthesis.

9.4 : Nutrient Cycles in Ecosystem

Q.22.Define nutrient cycle.

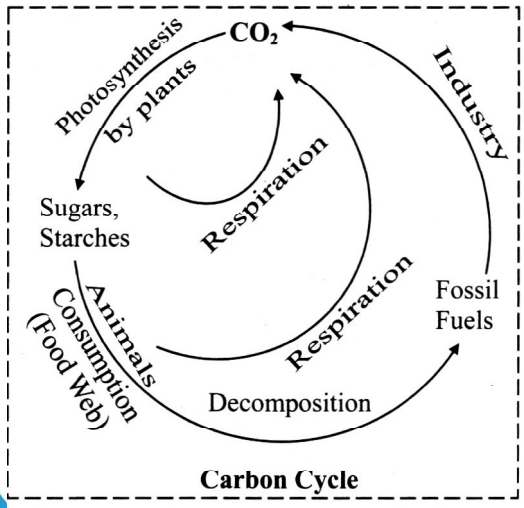
Ans: Nutrient cycle refers to the storage and transfer of nutrients through the biotic and abiotic components of the ecosystem.

Q.23.Comment in detail on carbon cycle.

Ans: Reservoir of carbon :

Carbon constitutes about 49% of the dry weight of organisms. It is estimated that 71% of the global carbon is found in the dissolved form in oceans. Reservoir of carbon is found in hydrosphere (Oceans), lithosphere (as deposits of fossil fuels) and in atmosphere (as carbon dioxide). In oceans, it remains stored as bicarbonates as limestone and marble rocks.

Cyclic pathway of carbon :



Carbon Cycle

i) The carbon enters the biotic components of ecosystem through green plants, photosynthetic bacteria and cyanobacteria in terrestrial ecosystem and through phytoplanktons and hydrophytes in the aquatic ecosystem. These are called producers and carry out photosynthesis by taking in the atmospheric CO_2 and make carbohydrates and oxygen.

ii) Carbohydrates are used as source of food by animals. Thus, carbon fixed by producers enters the food chain and keeps moving through different living organisms. They are returned to the soil in the form of detritus.

iii) The decomposers breakdown the larger organic compounds into simpler ones and then into inorganic molecules. In this process, small amount of CO_2 is returned back to atmosphere during enzyme catalyzed breakdown of dead matter by decomposers.

iv) CO_2 is released into atmosphere by respiration of producer and consumers.

v) Burning of fossil fuels in automobiles and machineries to produce energy, burning of wood, organic debris also release CO_2 in atmosphere.

vi) Volcanic eruption and hot springs also release CO2 into atmosphere.

Q.24.Describe in detail phosphorous cycle.

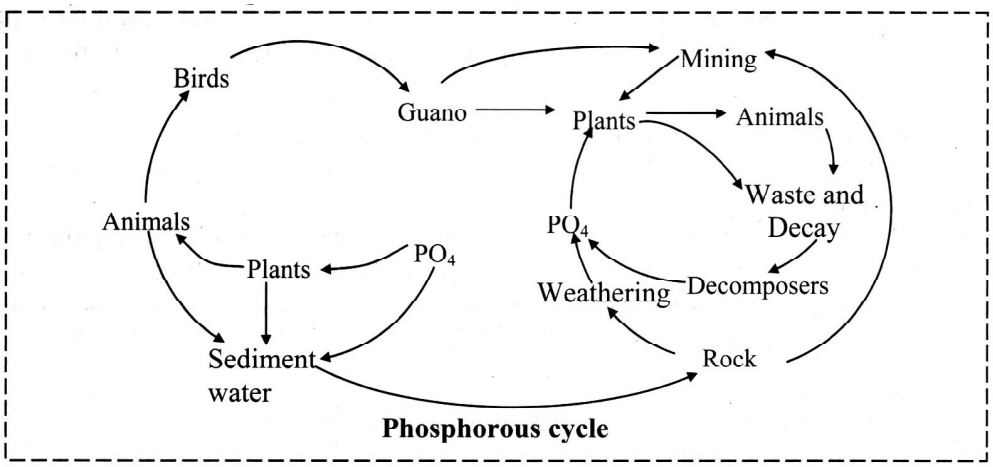
Ans: Reservoir of phosphorous :

Phosphorous cycle is an example of sedimentary cycle having its reservoir not in atmosphere, but the greatest reservoir of phosphate is the insoluble ferric and calcium phosphate in rocks. Inorganic phosphorous is added to the soil by weathering of rocks. Phosphatising bacteria add phosphorous ions by converting the organic phosphorous from detritus.

Cyclic pathway of phosphorous :

i) Phosphorous is the major constituent of DNA, RNA, and ATP. Thus, all organisms need phosphorous.

ii) Autotrophs (plants) take up phosphorous in the form of phosphate, as roots of the plants absorb it from soil.
iii) Heterotrophs (animals) obtain phosphorous from the plants as they eat food.
iv) Animals need large quantities of phosphorous to make bones, teeth and shells.
v) When animals or plants die (or when animals defecate), the phosphate may return to the soil or water by the decomposers. There it can be taken up by another plant and used again.
vi) The mining of phosphate and its use as fertilizer greatly accelerates the phosphorous cycle.
vii) Marine birds playa unique role in the phosphorous cycle. These birds eat marine fishes, which are rich in phosphorous. Their excreta called 'guano deposits' contain high levels of phosphorous and thus marine birds return phosphorous from the ocean to the land.



Phosphorous cycle

Q.25.Where is phosphorous found in living cells/organisms ?

Ans: In living cells/organisms, phosphorous is found in :

i) Biomembranes (as phospholipids)
ii) ATP (Adenosine triphosphate), ADP, GTP which are used as 'energy sources by cells.
iii) Nucleic acids (DNA and RNA)
iv) Bones and teeth of animals.

Q.26.Explain the term Eutrophication.

Ans:i) Due to mining of phosphate and its use as fertilizer, phosphorous is carried to water bodies.
ii) It causes overabundance of phosphorous in the coastal regions, at the mouths of rivers and any place where lots of sewage gets accumulated.
iii) Abundance of phosphate at such places causes overgrowth of algae in the water.
iv) Algae uses all the oxygen in water. Due to deficiency of oxygen in water, other organisms get killed. This is called as eutrophication.

9.5 : Ecological succession

Q.27.What is meant by ecological succession ?

Ans:Ecological succession :

The gradual (and predictable) change in the species composition of a given area is called ecological succession. The ecological succession may replace one population of species by another leading to change in physical environment.

Q.28.Define Community.

Ans: Community is the sum total of all the populations in a given habitat.

Q.29.What are the different communities involved in ecological succession ?

Ans: The first community to inhabit an area is called **pioneer community,** while the last and stable community in an area is called **climax community.**

The intermediate communities between the pioneer and climax communities are called transitional **seral communities** or transitional communities.

Q.30.What are the two types of ecological succession based on water availability ?

Ans:i) The amount of water determines the pattern of ecological succession in the given area. Depending on the availability of water, there are two types of succession - **hydrarch succession** (hydro sere) and **xerarch succession** (xerosere).

ii) Hydrarch succession occurs in the 'areas where water is present in abundance. It begins with small phytoplanktons followed by submerged and free floating plants and then rooted hydrophytes, sedges, grasses and finally the trees. Similarly, there is a transformation which takes place from a pool of water to swamp, then marsh and then mesic conditions.

iii) The desert areas show xerarch succession (xerosere). It begins with growth of lichens which produce acids to dissolve rocks and bring about weathering of rocks that results in soil formation. Then, small plants like mosses can inhabit followed by herbs, shrubs and then trees. Ultimately, a stable climax forest community evolves.

Q.31.Describe the different communities involved in the process of succession.

Ans: Ecological succession involves pioneer community, seral c.?mmunities and climax communities.

i) Pioneer community :

The organisms which invade a bare area and initiate the succession are called pioneer species. Assemblage of pioneer species in a given area forms the pioneer community. The pioneer community accumulates soil and organic matter and changes the nature of substratum and physical environment. These conditions become favourable for another community.

ii) Seral community :

Second community brings about further increase in soil/sediment quantity, and biomass thus it gets replaced by third community. These different communities are represented by combination of mosses, lichens, herbaceous plants, shrubs, small trees, etc. The different communities which replace one another during succession are called seral communities.

iii) Climax community :

The community which gets established at the terminal stage is called climax community. It is near equilibrium with the environment and hence is stable. The climax stage is reached when the existing climax community can tolerate the conditions created by itself and there are no more successful species to replace them.

Q.32.From algae to forest, explain in relation with the succession.

Ans: i) Ecological succession from algae to forest represents hydro sere or hydrarch succession. It depends upon the amount of water available.

ii) Hydrarch succession begins with small phytoplanktons followed by submerged and free floating plants and then rooted hydrophytes, sedges, grasses and finally the trees.

iii) Similarly, the transformation takes place from a pool of water to swamp then marsh and then mesic conditions.

iv) The small plants like mosses can inhabit followed by herbs, shrubs and then trees.

33. Distinguish between Pioneer community and Seral communities.

Ans:

No.	Pioneer community	Seral communities
i)	Pioneer community represents the assemblage of pioneer species that initiate succession in any given region.	All those communities which get established after the pioneer community and just before the climax community, are called seral communities.
ii)	The pioneer species are generally small (in companson to those of climax community)	The species range from mosses, lichens, herbaceous plants, shrubs to small trees. .
iii)	The pioneer species show high rate of growth.	The initial communities show fast growth and at the later stages, they show slow growth.
iv)	They are easily replaced by the next community in succession.	Initial stages are easily replaced by the next community but later stages are not easily replaced.

Q.34. Distinguish between Primary succession and Secondary succession.

Ans:

No.	Primary Succession	Secondary Succession
i)	The primary succession starts in the area where no living organisms ever existed.	The secondary succession starts in an area which has lost all the living organisms once existed.
ii)	Primary succession starts in areas like bare rock, newly formed pond, newly cooled lava, etc.	Secondary succession starts in areas like abandoned farm, cut or burnt forest, flooded land, etc.
iii)	Primary succession is a very slow process.	Secondary succession is comparatively a faster process.

9.6 : Ecological services

Q.35.Enlist the important ecological services.

Ans: Carbon dioxide fixation, carbon assimilation, release of oxygen and pollination are the important ecological services.

Q.36.Define ecological services and explain some of them.

Ans: A wide range of economic, environmental and aesthetic benefits are provided to human beings by ecological processes of an ecosystem which are collectively called ecological services.e.g.

Fixation of carbon dioxide :

Carbon assimilation is the service provided by the environment which supports life of all living organisms. During the process, abiotic ecological factors like sunlight, water and CO_2 are used from the vicinity of green plants. These factors often become limiting factors for CO_2 fixation and determine the rate of photosynthesis in the given vegetation.

Release of oxygen :

Oxygen is released as a byproduct of photosynthesis, Thus, photosynthesis purifies the air. It takes part in ozone layer formation also, that protects us from harmful ultraviolet rays.

Pollination :

Environmental abiotic factor wind is an agent for pollination in many plants, especially mono cots that are important crop plants. (Water is an agent for aquatic plants). There are many insects, (like moths, beetles, butterflies, bees, etc.) and birds (like sun birds, humming birds, bulbul, etc.) which are pollinators. Fertilization and formation of seeds and fruits take place only after pollination.

9.7 : Environment Issues

Agrochemicals and their effects

Q.37.Write about the effects of agrochemicals.

Ans: Use of pesticides, weedicides and inorganic fertilizers has increased the yield of crops. Agrochemicals have made important contributions to the success of "green revolution".However, the use of certain agrochemicals has also been associated with some major environmental and ecological damages. These are :

i) The pesticides and weedicides are toxic, not only to target organisms but also to .rnany other nontarget organisms, which are important components of the soil ecosystem.

ii) Continuous use of inorganic fertilizers changes the chemical nature of soil and reduces its fertility.

iii) In addition, the run off of agrochemical fertilizers into streams, lakes and ponds can cause an increased productivity of those aquatic ecosystems causing eutrophication and algal blooms in the water bodies.

iv) The pesticide residues can remain in the soil for long and can enter the food chain and undergo biomagnification.

v) Pesticides also enter the aquatic food chain. They get accumulated in the fatty tissues of fishes as well as in birds which feed on them. This process is called as bioaccumulation.

vi) People handling pesticides in industries also suffer from various disorders like respiratory diseases, nervous disorders, skin diseases, blindness, etc.

Q.38.What is bioaccumulation? **[Oct 2014]**

Ans: The deposition of pesticides in the fatty tissues of fishes and aquatic birds which feed on them is called Bioaccumulation.

Q.39. What is bio-magnification? **[Mar 2013, 14]**

Ans: Increasing concentration of non-biodegradable pesticides in the top members of food chain IS called biomagnification. It is also called as bioconcentration.

Q.40. The agrochemicals have enriched the production but not water. Comment.

Ans: i) Agrochemical pesticides are mainly used to protect plants from pests and diseases, however only about 15% of the spray preparation hits the target.

ii) Agrochemicals can move to deeper layers of soil through percolation of water and finally reach the groundwater reserve, thus contaminating the ground water. Therefore, it is said that agrochemicals have enriched the production but not water. Solid waste management

Q.41. What are the causes of increasing solid wastes?

Ans: The causes of increasing solid wastes are:

i) Rapid increase in population and changed life style
ii) Unplanned urbanization
iii) Industrialization
iv) Increased human activities resulting in deposition of huge quantities of garbage every day.

Q.42. Enlist the different materials that constitute solid wastes.

Ans:i) Solid waste includes wastes from homes, offices, stores, hospitals, hotels, schools and colleges.

ii) The municipal solid wastes generally include domestic (food) waste, paper, plastics, glasses, metals, rubber, textile, leather, etc.

Q.43. How citizens should sort out solid wastes ?

Ans:i) All the accumulated wastes should be categorized into three types - Biodegradable, Non-biodegradable and Recyclable.

ii) Citizens must sort out the collected wastes into these three types.
iii) The biodegradable materials should be put into deep pits and must be left for natural breakdown.
iv) Every apartment must have a pit for domestic wastes.
v) The recyclable wastes such as newspapers, plastic bags of milk should be sold off.

Q.44.Write down the three major steps in the management of solid wastes.

Ans: Management of solid wastes involve three steps:

i) Collection and categorization of the wastes into three types - biodegradable, recyclable and nonbiodegradable.
ii) Recovery of resources like plastics, scrap metals, etc. for reuse and recycling.
iii) Safe disposal of the wastes.

Q.45. Write down the different modes of disposal of solid wastes and their disadvantage.

Ans: Solid wastes can be disposed by the following ways :

i) **Incineration or burning :** It involves the aerobic burning of solid wastes like garbage, to reduce the volume of solid wastes. This is an ideal method for medical waste management as it eliminates the infectious organisms. The final products are ashes. Disadvantage: Open burning is hazardous as generally it is not burnt to completion which causes air pollution Open dumps serve as the breeding place for rats and flies.

ii) **Sanitary landfills :** In this, solid wastes are dumped into a trench or depression after compaction and covered with soil everyday.

Disadvantage: Amount of garbage in metro cities has increased so much, that these sites are getting filled too. Also, there is a danger of seepage of chemicals from landfills which may pollute ground water resources.

Q.46.What IS polyblend ?

Ans: Polyblend is a fine powder of recycled and modified plastic. This powder can be mixed with bitumen to lay roads.

Q.47.Write a note on case study of polyblend invention by Ahmed Khan.

Ans: Ahmed Khan is a plastic sack manufacturer in Bengaluru who has managed to find the ideal solution to ever increasing problem of accumulating plastic waste, as he realised that the plastic waste was a real problem. Then, his company started manufacturing **polyblend**, a fine powder of recycled and modified plastic. This powder was mixed with bitumen which was used to lay roads. In collaboration with R.V. College of Engineering and Bengaluru city corporation, Ahmed Khan proved that mixture of polyblend and

bitumen, when used to lay roads, enhanced the water repellant property of bitumen and the road life was increased. By the end of year 2002, more than 40 kms of road has been laid in Bengaluru using Ahmed Khan's technique.

Green house effect and global warming

Q.48.Name the green house gases present in the atmosphere.

Ans: Carbon dioxide, methane, nitrogen oxides and chlorofluorocarbons are the green house gases present in the atmosphere.

Q.49.Define global warming.

Ans: Global warming is an increase in global mean temperature caused by green house effect.

Q.50.Define 'greenhouse effect'. **[Oct 2013]**

Ans: The heating-up of earth's atmosphere due to trapped infrared rays reflected from earth surface by atmospheric gases is called greenhouse effect.

Q.51.What is green house effect and how does it lead to global warming?

Ans: i) The green houses are used for growing plants in winter and also those plants which require a slightly higher temperature.

ii) The greenhouse effect is a naturally occuring phenomenon which is responsible for heating the surface of earth and its atmosphere.

iii) The atmosphere of earth functions like the glass panel of greenhouse. It allows most of the sunlight to reach earth's surface, but does not allow long wave radiation (infrared radiation) to escape from earth.

iv) These long wave radiations are absorbed by green house gases like CO_2, N_2O (Nitrous oxide), chlorofluorocarbons, methane, etc and heat is radiated back to earth's surface. Thus, greenhouse gases are responsible for keeping the earth warm.

v) Due to human activities, concentration of these greenhouse gases has increased causing more and more absorption of infrared radiation. This leads to enhanced greenhouse effect causing global warming.

Q.52.Which greenhouse gas is mainly responsible for global warming? **[Oct 2014]**

Ans: Carbon dioxide (C02) gas is mainly responsible for global warming.

Q.53.The CO_2 has crucial role in global warming. Explain.

Ans: i) Various activities of human beings such as destruction of forests, combustion of fossil fuels, cement plants and other industries, respiration by living organisms leads to production of CO_2.

ii) An increase in the CO_2 concentration in the atmosphere retains the infra-red radiations of the sun and increases earth's temperature.

iii) Along with CO_2, other gases like methane, CFCs and nitrogen oxides also form a blanket in the atmosphere which traps the reflected infrared rays.

iv) Since the infrared radiation has heating effect, it warms up the earth. This results in green house effect and global warming. Hence, CO2 plays a crucial role in global warming.

Q.54.Write down the harmful effects of global warming.

Ans: i) Effects of global warming on weather and climate :
The average temperature of earth has increased due to global warming.
It leads to hotter summers, desertification and change in rainfall pattern.

ii) Rise in sea level :
Rise in temperature leads to rise in sea level due to thermal expansion of sea water and melting of polar ice caps and glaciers. It also causes flooding in low-lying coastal areas.

iii) Effects on food production :
A slight increase in temperature will cause negative impact on productivity of crops. Desertification due to hotter summers and low precipitation reduces the fertility of soil.

iv) Effects on species distribution :
Plant and animal species normally occur within a specific range of temperature. Thus, temperature riseresults in migration of these species towards cooler regions. Those species which cannot migrate fast may become extinct.

Q.55.Enlist the control measures to check global warming.

Ans: Some of the control measures to check global warming include:

i) Controlling the emission of greenhouse gases like carbon dioxide by growing more trees.

(Controlling deforestation and encouraging growth of forest cover)

ii) Minimizing the use of fossil fuels to reduce emission of greenhouse gases and developing other renewable sources of energy.

iii) Encouraging the use of organic manure and biofertilizers while controlling the use of chemical fertilizers.

iv) Developing substitutes for chlorofluorocarbons.

Q.56. Explain in brief the role of ozone.

Ans:i) Harmful U.V. radiations are absorbed by the ozone layer of stratosphere before the sunrays reach the earth surface. Ozone layer acts as a shield protecting life on earth from harmful effects of U.V.rays.

ii) Ozone layer plays an important role in controlling global warming which causes several hazardous effects on earth and living organisms.

iii) Many greenhouse gases like CO_2 ,CFCs, methane are causing ozone layer depletion due to which living organisms on earth are facing many health issues. Thus, ozone layer plays an important role for protecting life on earth.

Q.57.What is ozone hole?

Ans: In the Antarctic region, there is formation of large area of thin ozone layer which is commonly called ozone hole.

Q.58. 'There is a hole in the ozone layer'. What do you understand by this? [Mar 2014]

Ans:i) 'There is a hole in the ozone layer', this statement indicates that, there is a formation of large area of thin ozone layer.

ii) Ozone hole formation occurs due to depletion of ozone layer, which is caused by CFCs.

iii) CFCs emitted by human activities, move up and enter the stratosphere. UV rays act on CFCs and release Cl" atoms.

iv) Cl^- atoms act as a catalyst and continue to degrade ozone, which leads to the formation of ozone hole.

Q.59. How do CFCs damage the Ozone layer ?

Ans:i) CFCs are widely used in refrigerators and aerosol sprays.

ii) The CFCs liberated in the lower atmosphere move upward and reach the stratosphere.

iii) The CFCs are broken down by UV-rays to produce Cl and ClO radicals which are called as 'active chlorine'. They act as a catalyst in the process of dissociation of ozone.

iv) Cl acts only as a catalyst and is not used up in the reaction. Hence, whenever CFCs are added to the atmosphere they have permanent and continuing damaging effects on ozone layer.

Q.60. What is Montreal protocol? What was its objective ?

Ans:i) Montreal Protocol is an international treaty which was signed amongst 27 countries at Montreal (Canada) in the year 1987.

ii) Its main objective was to protect the stratospheric ozone by limiting the production and use of ozonedepleting substances, developing alternatives to chlorofluorocarbons, phasing out of ozone depleting substances.

Q.61. Mention the harmful effects of ozone depletion.

Ans: i) The thinning of the ozone layer results in an increase in the levels of UV radiation reaching the earth's surface. .

ii) In humans, increased UV radiation causes ageing of skin, damage/injuries to skin cells and skin cancers including melanoma.

iii) It also causes cataract and even permanent damage to cornea, weakening of immune system.

iv) UV radiation also causes mutations in living organisms.

iv) DNA and proteins of living cells absorb the UV rays, high energy of UV .radiation breaks the chemical bonds of these molecules, thus affecting the normal metabolism.

v) UV radiation inhibits photosynthesis in most phytoplanktons as it penetrates through the ocean water. This affects the entire food chain in aquatic ecosystem.

Deforestation

Q.62. What is meant by deforestation?

Ans: Deforestation is the permanent removal, decrease or deterioration of forests and woodlands.

Q.63. What are the causes of deforestation?

Ans: The causes of deforestation are:

i) Intensive collection of firewood.
ii) Clearing of land for agriculture.
iii) Developing pastures for grazing animals.
iv) Carrying out mining activities.
v) Obtaining land for construction of roads, dams and buildings.
vi). Selling wood for earning foreign exchange.
vii) Meeting the increasing demand of timber wood.
viii) Natural calamities like wildfire, floods, storms, volcanic eruptions, earthquakes, etc.

Q.64. What are the effects of deforestation ?

Ans: The effects of deforestation are :

i) Loss of biodiversity due to extinction of species.
ii) Reduced soil fertility and soil erosion.
iii) Regional and global climatic changes.
iv) Global warming
v) Shortage of fuel wood and timber.
vi) Increased incidents of landslides.

Q.65. What is agroforestry ?

Ans: The practice of using the same land for agriculture and forestry is known as agroforestry.

Q.66. What is reforestation ?

Ans: Restoring a forest that once existed is called Reforestation.

Q.67. What is afforestation ?

Ans: Plantation of trees in barren and unexploitedland to improve the environment is called afforestation.

Q.68.What are the different ways of conservation and management of forests?

Ans: Conservation and management of forests can be done by the following ways:

i) By effective control of wild fire using suitable measures.
ii) By regulating grazing of animals in forests lands.
iii) By protecting forests from pests and pathogens.
iv) Economic use of timber and fuel wood to avoid its wastage.
v) Forest conservation through law, adopting reforestation and afforestation.
vi) Encouraging agro-forestry.
vii) Educating people about hazards of deforestation.

Q.69. Discuss the role of women and communities in protection and conservation of forests.

Ans: i) In 1731, the king of Jodhpur ordered his minister to arrange wood for constructing a new palace. The minister and workers wanted to cut down the trees of a forest inhabited by Bisbnois. Bisbnois were very much dependent on the various forest products for their living. Amrita Devi, a Bisbnoi woman showed courage by hugging a tree and telling the king's men to cut her first before cutting the tree. Unfortunately the king's men, more afraid of the king, cut down the tree along with Amrita Devi. Her three daughters and hundreds of other Bisbnois followed her and lost their lives to save trees. The Government of India has recently instituted the **Amrita Devi Bishnoi Wildlife protection** award for individuals or communities from rural areas that have shown extraordinary courage and dedication in protecting wildlife.

ii) **Chipko Movement** was initiated in Garhwal Himalayas in 1974; the local women showed enormous bravery in protecting the trees from the axes of contractors by hugging them.

iii) The Government of India has introduced in 1980, the concept of **Joint Forest Management (JFM),** so as to work closely with the local communities for protecting and managing the forest; in return for their services to the forest, the communities get benefit of various forest products (like fruits, medicine, rubber, gum, firewood, etc.) and thus the forest is protected in a sustainable manner.

Additional Theory Questions :

Q.1. Distinguish between habitat and niche. *Refer Q.4.*

Q.2. Write a short note on productivity. *Refer Q.11.*

Q.3. Explain the concept of primary productivity. [Oct 2013] *Refer Q.10. (i) and 12.*

Q.4. Define decomposition and describe the process and products of decomposition. *Refer Q.13 and 14.*

Q.5. Explain the concept of pyramid of numbers. *Refer Q.16 (i)*

Q.6. Explain the energy flow model. *Refer Q.20.*

Q.7. Give schematic representation of carbon cycle. [Mar 2013] *Refer Q.23.*

Q.8. Describe the pathway followed by phosphorous in an ecosystem. *Refer Q.24.*

Q.9. Define ecological succession. Refer Q.27.

Q.10. How do agrochemicals cause damage to the environment ? *Refer Q.37.*

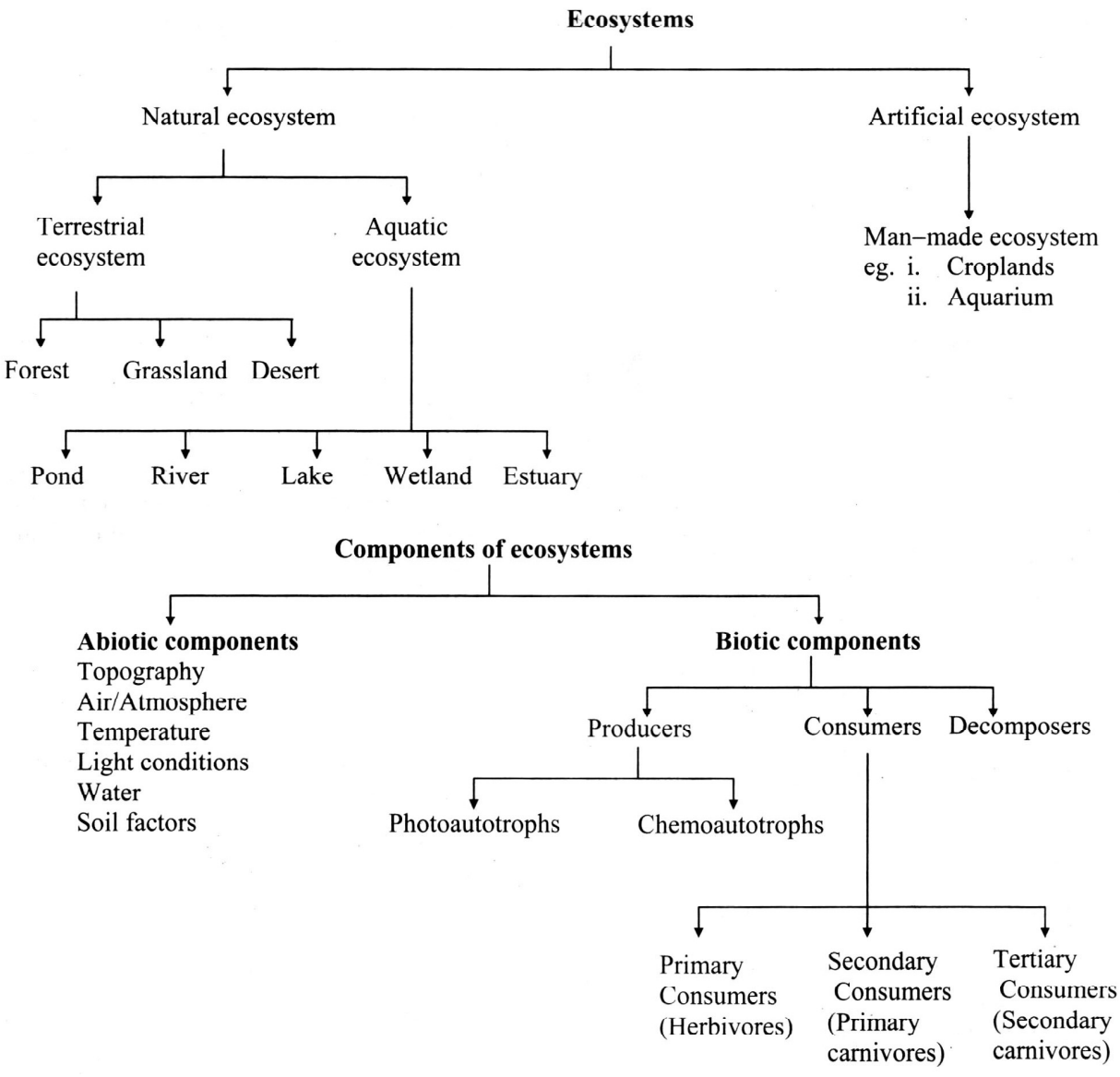
Q.11. What is bioconcentration? Refer Q.39.

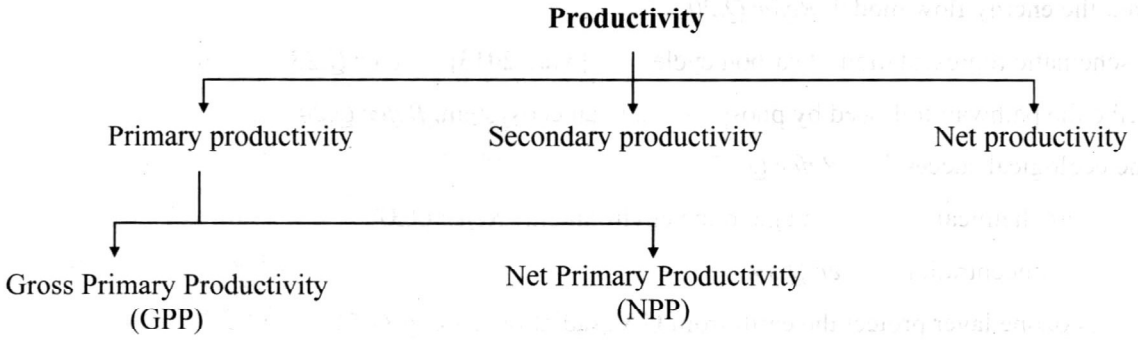
Q.12. How does ozone layer protect the earth from U.V. radiations ? *Refer Q.56.*

Q.13. Give the hazards of deforestation. [Mar 2013 Old Course] *Refer Q.64.*

Q.14. Suggest measures to conserve the forests. [Oct 2014] *Refer Q.68.*

Quick Review :





- **Some important days related to ecology :**

3rd December	WorId Conservation Day
21st March	World Forest Day
2200 April	First International Earth Day
5th June	World Environmental Day
16th September	International Day for preservation of ozone layer

- **Scientists and their contribution :**

No.	Scientists	Contribution	Year
i)	Grinnel	First used the term 'Niche'	1971
ii)	Ahmed Khan (Plastic sacks producer In waste Bengaluru)	Developed Polyblend, a remedy for plastic waste	-

Multiple Choice Question

1. _____is an artificial ecosystem.
a) Pond b) Lake
c) Aquarium d) Wetland

2. The ability to produce organic compounds in unit time is
a) leaching b) productivity
c) poaching d) conductivity

3. Guano deposits are rich in **[Oct. 2013]**
a) sulphur b) magnesium
c) phosphorous d) calcium

4. Which of the following processes help In
a) Mineralization
b) Immobilization
c) Leaching
d) Nitrification

5. The succession that starts on abandoned crop land is
a) primary succession
b) xerarch succession
c) secondary succession
d) hydrarch succession

6. The horizontal distribution of trees is studied in
a) Scarification b) stratification
c) zonation d) speciation

7. The pattern of ecosystem in which density and distribution of species vary along a horizontal gradient is____. **[Mar - 2013]**
a) zonation b) stratification
c) ecological niche d) speciation

8. In establishing new ecosystem on rock, the pioneers are____.
a) lichens b) phytoplanktons
c) trees d) animals

9. The direction of succession is
a) predictable b) unpredictable
c) haphazard d) always changing

10. Pyramid of energy is always
a) inverted b) upright
c) spindle - shaped d) cup - shaped

11. Energy transferfrom one trophic level to other in a food chain is
a) 1% b) 2%
c) 10% d) 20%

12. In the ecosystem, _____% of sunlight is reflected back.
a) 15 b) 34
c) 48 d) 70

13. In which one of the following ecosystems can inverted pyramid of biomass be traced ?
a) Rain forest b) Desert
c) Ocean d) Tundra

14. Energy enters the ecosystem through
a) decomposers b) producers
c) herbivores d) carnivores

15. Ecology deals with
a) the earth and planets.
b) the relationship between organisms and their environment.
c) economical growth of poor people.
d) the life under sea.

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16. The statement "Tiger is the apex of food chain" indicates that
a) tiger is carnivore.
b) tiger has many enemies.
c) tiger has maximum biomass.
d) tiger is dependent upon large number of

17. Ecological services include
a) deforestation b) water pollution
c) pollination d) global warming

18. Maximum CO_2 fixation is done by
a) fungi b) phytoplanktons
c) zooplanktons d) bacteria

19. About 71% of total global carbon is found in
a) oceans b) forests
c) grasslands d) agro ecosystem

20. Abundance of phosphate, causing algal overgrowth, resulting in depletion of oxygen and killing other aquatic life is known as **[Mar 2014]**
a) Ecological succession
b) eutrophication
c) guano deposits
d) greenhouse effect

21. The final stable community in ecological succession is
a) pioneers b) sere
c) carnivores d) climax

22. The main green house gas is
a) ozone b) oxygen
c) helium d) CO_2

23. Which of the following is mainly responsible for ozone depletion ?
a) chlorofluorocarbons
b) hydrocarbons
c) carbon monoxide
d) carbon dioxide

24. The depletion of ozone layer is due to____.
a) CO_2 b) CO
c) CH_4 d) CFCs

25. Greenhouse effect with respect to global climate refers to
a) cooling of earth
b) warming of earth
c) increased rainfall and greenery
d) desertification

26. Which harmful radiations are absorbed by ozone layer ?
a) UV b) X-ray
c) visible light d) gamma rays

27. Use of pesticides is problematics as
a) their residues persist in water and environment
b) kill silkworms.
c) mosquitoes have become resistant to DDT
d) gills of fishes have become deformed

28. Biomagnification refers to
a) rapid growth due to excessive intake of nutrients.
b) increase in population size.
c) decrease in population size.
d) increase in concentration of nondegradable pollutants as they pass through a food chain.

29. Montreal protocol refers to
a) substances that deplete ozone layer.
b) persistent organic pollutants.
c) global warming and climatic change.
d) biosafety of genetically-modified

30. The permanent removal of forests and woodlands is called. **[Mar 2014]**
a) reforestation b) afforestation
c) deforestation d) agroforestry

31. Which one of the following disorders of eyes are caused due to UV radiations from the sun ?
a) Snow-blindness cataract
b) Glaucoma
c) Dilation of pupil
d) Retinal effect

32. Polyb1end is
a) an effective medicine for cancer.
b) substance causing global warming.
c) substance causing eutrophication.
d) fine powder of recycled modified plastic.

33. People all over the world have acclaimed the Chipko movement of
a) Kerala b) Garhwal
c) Tamilnadu d) Maharashtra

34. IS celebrated as World Environmental Day.
a) 15th June b) 30th August
c) 1st December d) 5th June

35. The forest cover of India is presently about ___ % only.
a) 2 b) 35
c) 19 d) 65

Answer Keys

1. c)	2. b)	3. c)	4. a)	5. c)	6. c)	7. a)	8. a)	9. a)	10. b)
11. c)	12. b)	13. c)	14. b)	15. b)	16. a)	17. c)	18. b)	19. a)	20. b)
21. d)	22. d)	23. a)	24. d)	25. b)	26. a)	27. a)	28. d)	29. a)	30. c)
31. a)	32. d)	33. b)	34. d)	35. c)					

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